

REMARKS

Claims 1-6, and 8-13 are pending. Claims 1, 4, 8, and 10 have been amended. Claim 7 has been cancelled. New claims 12 and 13 have been added to further define Applicant's invention. No new matter has been introduced. Reexamination and reconsideration of the application are respectfully requested.

In the March 10, 2004 Office Action, the Examiner objected to the FIG. 2 because the figure needs a "prior art" label. The Applicant has enclosed a redlined version of FIG. 2, and provided a replacement FIG. 2 labeled "Prior Art". The Examiner objected to claims 3, 7, and 8 because of certain informalities. The Applicant has amended claims 3, and 8 to overcome this objection. Claim 7 has been cancelled. The Examiner objected to the specification for failing to provide proper antecedent basis for the claimed subject matter. The Examiner rejected claims 1-3 and 10-11 under 35 U.S.C. §112, first paragraph, alleging that the specification does not reasonably provide enablement for the claim subject matter. The Applicant has amended claims 1, and 10 to overcome this rejection. Applicant notes that the calculation unit includes is at least one calculator for each channel. Therefore, there are at least N calculators.

The Examiner rejected claims 1, 3, 4, 6, and 9 under 35 U.S.C. §102(b) as being anticipated by Davis et al., U.S. Patent No. 5,291,557 (hereinafter the Davis reference). The Examiner rejected claims 2, 10, and 11 under 35 U.S.C. §103(a) as being obvious over Davis in view of Li et al., U.S. Patent No. 6,161,088 (hereinafter the Li reference). The Examiner rejected claim 5 under 35 U.S.C. §103(a) as being obvious over Davis in view of Laczko, Sr. et al., U.S. Patent No. 5,845,239 (hereinafter the Laczko reference). These rejections are respectfully traversed.

An encoding and decoding system is provided that includes an encoding device for encoding and compressing audio signals and a decoding device for expanding compressed audio signals, wherein the amount of calculations performed in the decoding device is reduced to ease processing loads to a digital signal processor (DSP) in the decoding device.

The encoding device inputs four-channel or five-channel audio signals, which are suited to recording of digital signals on digital storage media such as DVDs. The encoding device converts the four-channel or five-channel audio signals to two-channel audio signals, which are then subjected to compression in accordance with the MPEG standard, for example. Matrix coefficients are calculated based on the two-channel audio signals. The compressed two-channel audio signals together with the matrix coefficients are recorded on the prescribed digital storage medium such as a DVD, which is manufactured by the digital contents manufacturer or which is distributed by the digital contents provider. Alternatively, the broadcasting station is capable of broadcasting digital contents based on the compressed two-channel audio signals together with the matrix coefficients. This eliminates the necessity of performing complicated calculations for producing the matrix coefficients in the decoding device, so that its circuit configuration can be simplified, and its processing load can be reduced.

**The decoding device inputs the compressed two-channel audio signals together with the matrix coefficient.** The compressed two-channel audio signals are expanded and are then subjected to prescribed arithmetic operations using the matrix coefficients. Thus, the decoding device reproduces the original audio signals.

**Independent claim 4, as amended, recites:**

A decoding device for audio signals, comprising:

an expansion unit for receiving compressed M-channel signals (where 'M' is a positive integer greater than zero) and matrix coefficients from an encoding source, so that the expansion unit performs expansion on the compressed M-channel signals to reproduce M-channel signals; and

a calculation unit for performing prescribed calculations using the matrix coefficients on the M-channel audio signals, thus reproducing N-channel audio signals (where 'N' is an integer greater than one), wherein the calculation unit includes at least N calculators, each of which performs arithmetic operations using corresponding matrix coefficients within the matrix coefficients so as to convert the M-channel audio signals to an audio signal of a channel within N channels.

In the Office Action, the Examiner rejected claims 1, 3, 4, 6, and 9 under 35 U.S.C. §102(b) as being anticipated by the Davis reference. In so doing, the Examiner stated "Davis discloses a decoder apparatus (fig. 1b and fig. 3b) comprising a de-multiplex/de-format (62) coupled to bit-rate reduction decoders (68 and 70) for receiving compressed M-channel signals (64 and 66), wherein, the signals are subjected to bit-rate reduction in decoders, which inherently reads on expansion of M-channels producing two signals (74 and 76) as evident by the fact bit rate reduction takes place in the decoder, which is an inverse of bit rate reduction that takes place in the encoder (col. 12, lines 11-50)."

The Davis reference does not disclose, teach, or suggest a decoding device for audio signals as recited in independent claim 4, as amended. Unlike the decoding

device for audio signals specified in independent claim 4, as amended, the Davis reference does not show “an expansion unit for **receiving compressed M-channel signals** (where ‘M’ is a positive integer greater than zero) and **matrix coefficients** from **an encoding source**, so that the expansion unit performs expansion on the compressed M-channel signals to reproduce M-channel signals”

The Davis reference states “referring now to the decoder arrangement of FIG. 3B, input 60 **receives the encoded audio signals and the matrix selection indicating bit** from a transmission channel or a storage and retrieval channel.” (Col. 10, lines 11-14.) The Davis reference also states “The adaptive rematrix takes one of two forms: an identity, no change matrix and a sum/difference matrix. Thus, the outputs A and B from the adaptive rematrix 4 are either  $L_T$  and  $R_T$  from the identity matrix as shown in Equations 1 and 2 or  $L_T' = 1/2(L_T + R_T)$  in lieu of  $L_T$  and  $R_T' = 1/2(L_T - R_T)$  in lieu of  $R_T$  from the alternate sum/difference matrix. A **control signal** on line 6 indicates **which form of the rematrix is in use.**” (Col. 8, lines 53-61.)

The Davis reference does show “an expansion unit for **receiving compressed M-channel signals** (where ‘M’ is an positive integer greater than zero) and **matrix coefficients** from **an encoding source**, so that the expansion unit performs expansion on the compressed M-channel signals to reproduce M-channel signals”. The Davis reference essentially teaches a decoder receiving encoded audio signals and the control signal (matrix selection indicating bit) from an encoder.

Accordingly, Applicant respectfully submits that independent claim 4, as amended, distinguishes over the above-cited reference. Claims 5 and 6 depend directly from independent claim 4, as amended. Therefore, Applicant respectfully

submits that claims 5 and 6 distinguish over the above-cited reference for the same reasons as set forth above with respect to independent claim 4, as amended.

**Independent claim 1, as amended, recites:**

An encoding device for audio signals, comprising:

a matrix encoder for converting N-channel audio signals (where 'N' is an integer greater than one) to M-channel audio signals (where 'M' is a positive integer smaller than 'N');

a matrix coefficient calculation unit for calculating matrix coefficients based on the M-channel audio signals, wherein the matrix coefficients are to be used in decoding of the M-channel audio signals; and

a compression unit for performing compression on the M-channel audio signals, thus producing compressed M-channel audio signals, which are output therefrom together with the matrix coefficients and provided to a decoding device.

The Davis reference does not disclose, teach, or suggest an encoding device for audio signals as recited in independent claim 1, as amended. Unlike the encoding device for audio signals specified in independent claim 1, as amended, the Davis reference does not show "a compression unit for performing compression on the M-channel audio signals, thus producing **compressed M-channel audio signals**, which are **output therefrom together with the matrix coefficients and provided to a decoding device.**"

As discussed above, the Davis reference essentially teaches a decoder receiving encoded audio signals and the control signal (matrix selection indicating bit) from an encoder.

Accordingly, Applicant respectfully submits that independent claim 1, as amended, distinguishes over the above-cited reference. Claims 2 and 3 depend directly from independent claim 1, as amended. Therefore, Applicant respectfully submits that claims 2 and 3 distinguish over the above-cited reference for the same reasons as set forth above with respect to independent claim 1, as amended.

**Independent claim 10, as amended, recites:**

An encoding and decoding system for audio signals, comprising:  
an encoding device in which N-channel audio signals (where 'N' is an integer greater than one) are subjected to encoding to produce M-channel audio signals (where 'M' is a positive integer smaller than 'N'), which are then subjected to compression to produce compressed M-channel audio signals, wherein matrix coefficients are produced by performing prescribed calculations on the M-channel audio signals, and the compressed M-channel audio signals and matrix coefficients are provided to a decoding device; and

the decoding device in which the received compressed M-channel audio signals are subjected to expansion to reproduce the M-channel audio signals, which are then subjected to arithmetic operations using the received matrix coefficients to reproduce the N-channel audio signals, wherein a calculation unit performs prescribed calculations using the matrix coefficients on the M-channel audio signals, thus reproducing N-channel audio signals, the calculation unit includes at least N calculators, each of which performs arithmetic operations using corresponding matrix coefficients within the matrix coefficients so as to convert the M-channel audio signals to an audio signal of a single channel within N channels.

The Davis reference does not disclose, teach, or suggest an encoding and decoding system as recited in independent claim 10, as amended. Unlike the an encoding and decoding system specified in independent claim 10, as amended, the Davis reference does not show “the compressed M-channel audio signals and matrix coefficients are provided to a decoding device” and “the decoding device in which the received compressed M-channel audio signals are subjected to expansion to reproduce the M-channel audio signals, which are then subjected to arithmetic operations using the received matrix coefficients to reproduce the N-channel audio signals”.

The Li reference does not make up for the shortcomings of the Davis reference. The Li reference does not show “the compressed M-channel audio signals and matrix coefficients are provided to a decoding device” and “the decoding device in which the received compressed M-channel audio signals are subjected to expansion to reproduce the M-channel audio signals, which are then subjected to arithmetic operations using the received matrix coefficients to reproduce the N-channel audio signals”.

Accordingly, Applicant respectfully submits that independent claim 10, as amended, distinguishes over the above-cited reference. Claims 11, 12, and 13 depend directly from independent claim 10, as amended. Therefore, Applicant respectfully submits that claims 11, 12, and 13 distinguish over the above-cited reference for the same reasons as set forth above with respect to independent claim 10, as amended.

Applicant believes that the foregoing amendment and remarks place the application in condition for allowance, and a favorable action is respectfully requested.

If for any reason the Examiner finds the application other than in condition for allowance, the Examiner is requested to call the undersigned attorney at the Los

Angeles telephone number (213) 488-7100 to discuss the steps necessary for placing the application in condition for allowance should the examiner believe that such a telephone conference would advance prosecution of the application.

Respectfully submitted,

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## PRIOR ART

FIG. 2

